



Service Data

SD-02-4600

Bendix® DD-3™ & SD-3™ Safety Actuators

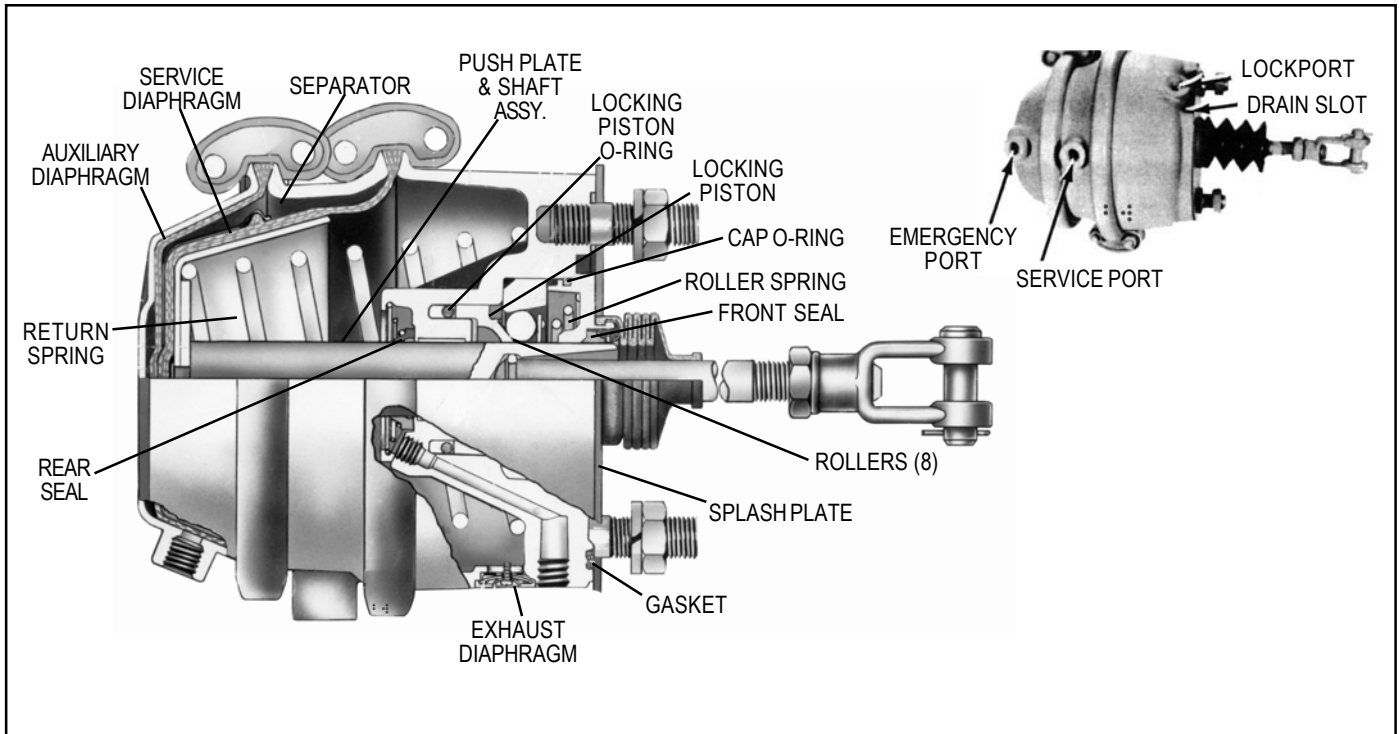


FIGURE 1 - DD-3™ SAFETY ACTUATOR

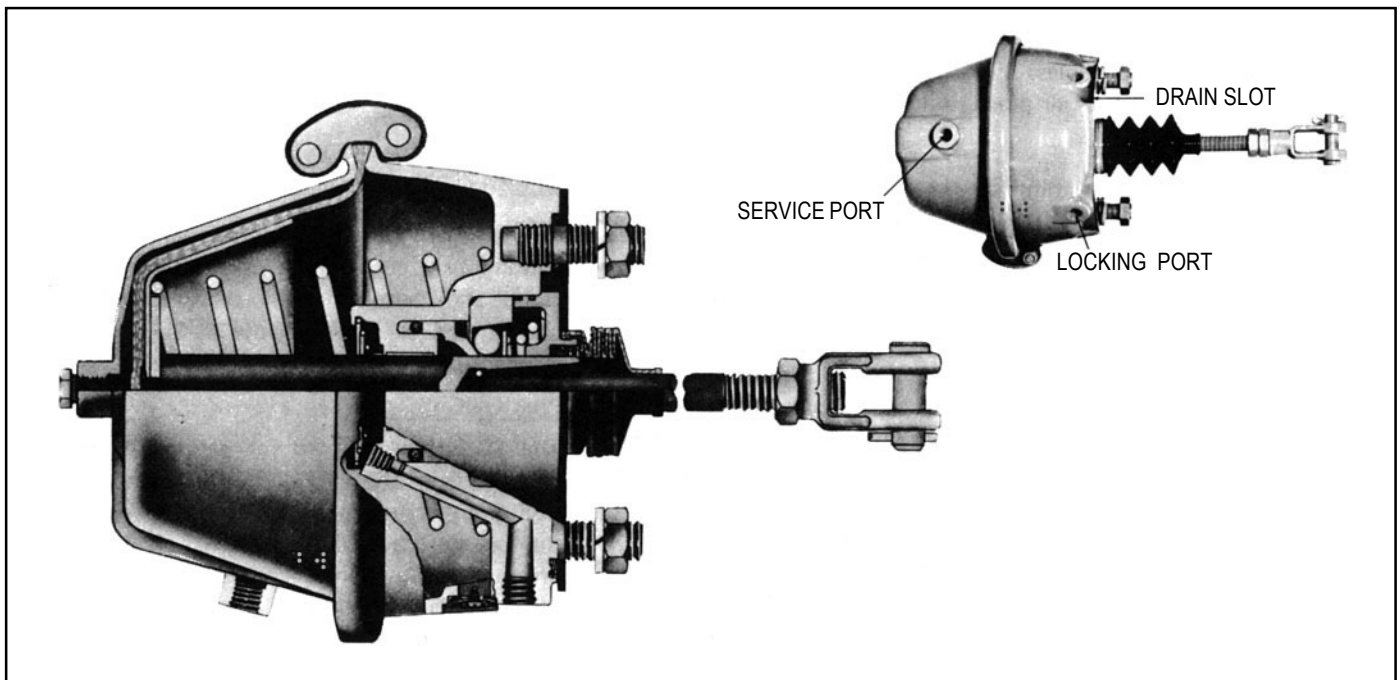


FIGURE 2 - SD-3™ SAFETY ACTUATOR

DESCRIPTION

The DD-3™ and SD-3™ are air operated actuators with a mechanical push shaft lock. The DD-3™ actuator (see Fig. 1) is a double diaphragm device which provides braking for service, emergency, and parking. It is available in two sizes: type 24 and type 30.

The SD-3™ actuator is a single diaphragm device used primarily on off-highway vehicles. It provides service braking and parking. It is available as a diaphragm type in type 30 (see Fig. 2) and in rotochamber configuration in type 36 and 50 (see Fig. 3).

The locking mechanism function is identical in all SD-3™ and DD-3™ actuators.

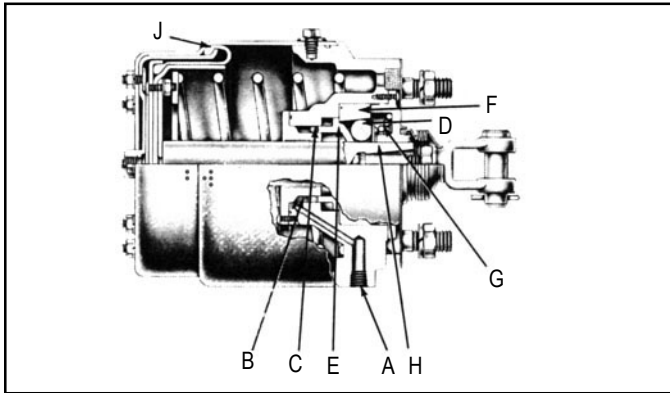


FIGURE 3

In normal operation, the SD-3™ or DD-3™ safety actuator is similar to a brake chamber or rotochamber. However, the addition of a locking roller mechanism locks the push rod in the extended position unless the rollers are held out of place by the application of air pressure at the lock port A (Fig. 3).

In the normal operating position, air pressure is applied to lock port A and into cavity B. This pressure acting on piston C moves it forward, contacting rollers D, pushing them up ramp E. Spring G then holds rollers D between ramp E and collar ramp F and away from push rod H. The push rod is then free to move back and forth with the application and release of service air pressure.

In the park position, air pressure is vented from lock port A and cavity B, permitting piston C to move back. Spring G forces rollers D against collar ramp F and push rod H. During this sequence, a parking brake application has been made with air pressure. However, if air pressure behind diaphragm J is lost for any reason, push rod H will attempt to move back to the released position but the wedge shape of collar ramp F will force the rollers against the push rod, thereby preventing any return movement of the push rod. The brake application is now held mechanically and will be maintained until air pressure is again applied to the lock port. The rollers will be released when the push rod is slightly extended with a service application.

OPERATION - DD-3™ ACTUATOR (FIG. 1) - NORMAL RUNNING

For normal operation full reservoir pressure is applied continuously at the lock port, keeping the rollers disengaged and permitting the shaft to extend and retract unrestricted. Applications may be made by means of applying air pressure on either the service diaphragm or the auxiliary diaphragm. The auxiliary diaphragm has about 80% of the effective area of the service diaphragm.

EMERGENCY

The auxiliary diaphragm of the DD-3™ actuator may be connected to an alternate source of air pressure thus providing an emergency capability.

PARKING

The DD-3™ actuator parking function is activated by releasing the air pressure from the lock port and making a brake application. The application may well be made from the same alternate source as used for the emergency application. It should preferably be made on the auxiliary diaphragm for reasons which will be explained under "releasing."

If the air application is released or leaks off, the shaft will retract slightly and then be clamped by the wedging action of the rollers. The brakes may now be considered to be applied and to remain applied regardless of any exhaustion of energy or loss of air pressure.

RELEASE OF PARKING APPLICATION

To release a parking application, air pressure in excess of 40 psi must be applied at the lock port and a brake application slightly greater than the locked-in application must be made. Thus if the park application is made with the auxiliary diaphragm, an application of equal air pressure on the larger area service diaphragm will provide the heavier application required to free the lock rollers and release the park application.

OPERATION - SD-3™ ACTUATOR (FIG. 3) - NORMAL RUNNING

For normal operation full reservoir pressure is applied continuously at the lock port, keeping the rollers disengaged and permitting the shaft to extend and retract unrestricted. In this mode, the SD-3™ actuator functions the same as a standard brake chamber or rotochamber.

PARKING (SD-3™ ACTUATOR)

The SD-3™ actuator may be used for parking by releasing the air pressure from the lock port and making a limited application at a pressure somewhat less than the cut-in pressure of the air governor. For instance, if the governor cut-in pressure is 85 psi, the suggested parking pressure would be 75 psi. As the application is released, the lock mechanism will engage the shaft and retain the park application.

RELEASING (SD-3™ ACTUATOR)

To release the park application, air pressure in excess of 40 psi must be applied at the lock port and a service application slightly greater than the locked-in application made. For practical purposes, a full reservoir application should be made and held for 5 seconds to produce sufficient forward motion of the shaft to allow disengagement of the lock mechanism.

Various control systems are used to achieve the proper sequence of control signals. Bendix brochure "Off Highway Vehicle Braking System" (BW 1283) explains one such system.

PREVENTIVE MAINTENANCE

GENERAL

Depending on experience and type of operation, the drain slot in the actuator non-pressure plate should be checked and cleaned of any restricting road grime, mud, ice, snow, etc. Check or replace actuator boot if loose on the push rod or if worn.

Brake should be adjusted at the slack adjuster as is customary with standard brake chambers. Push rod travel should be as short as possible without brakes dragging. Excessive travel not only shortens the normal service life of the diaphragm but gives slow braking response and wastes air.

Push rod to slack adjuster alignment should be checked in both the applied and released positions. The rod should move out and return promptly without binding.

Check the angle formed by the slack adjuster arm and push rod. It should be 90° or greater when the actuator is in the applied or released position when brakes are properly adjusted.

EVERY MONTH, 300 OPERATING HOURS, OR AFTER 8000 MILES

Check push rod travel, alignment and nuts for tightness.

Check hoses. (See slack adjuster for adjustment.)

Check for proper operation.

EVERY 3 MONTHS, 900 OPERATING HOURS, OR 25,000 MILES

When grease fitting is provided, grease with Lubriplate "Aero" lubricant.

EVERY 12 MONTHS, 3600 OPERATING HOURS, OR 100,000 MILES

Disassemble, inspect diaphragms and rubber parts, rod, springs, and non-pressure plate. Replace all parts worn or damaged. Check for proper operation before placing vehicle in service.

REMOVING AND INSTALLING

Block and hold the vehicle by some means other than air brakes.

REMOVING DD-3™ ACTUATOR

With the actuators in a released position, disconnect the air lines to the service and auxiliary ports. Move the park control valve to the park position which will exhaust the air from the lock port. Disconnect the lock port line. Remove yoke pin and back off slack adjuster. Remove mounting nuts, then actuator.

REMOVING SD-3™ ACTUATOR

If the SD-3™ actuator is mounted on a vehicle with its own air supply, the parking control should be placed in the release position with the air system completely charged. Disconnect the service port line. Move the park control valve to the park position and disconnect the lock line. Remove the actuator as above.

If the SD-3™ actuator is mounted on a trailer, with no air supply present and in the applied position, completely drain trailer reservoir. Remove delivery and lock port lines from actuator. Release force from actuator by backing off slack adjuster or mounting nuts or both. Remove actuator.

INSTALLING

IMPORTANT - DD-3™ and SD-3™ safety actuators must be installed with the exhaust check valve down and the drain slot pointing down.

Mount actuator to mounting bracket and tighten securely.

Fasten actuator push rod yoke to slack adjuster with yoke pin. Lock yoke pin with cotter pin. The angle formed by the push rod and slack adjuster arm should be greater than 90°.

Connect air lines to actuator. Take care that the correct line is installed in the correct port.

Adjust brakes.

DISASSEMBLY

1. Clean actuator exterior of all road grime and mark in such a way so it can be assembled in the same manner.
2. Remove yoke and yoke lock nuts.
3. Remove splash guard, boot, felt breather, and gasket.
4. Remove auxiliary and service clamping ring nuts and bolts.

5. Spread clamping rings slightly, just enough to slip rings off plates. It may be necessary to use a soft mallet to break the clamping rings loose. If clamping rings are to be reused, caution should be taken so they are not distorted.
6. Remove auxiliary pressure plate, auxiliary diaphragm, service pressure plate, service diaphragm (with separator, if present). On SD-3™ actuators, pressure plate and service diaphragm only.
7. Place non-pressure plate assembly on a smooth surface with the push plate down.
8. Connect an air supply (shop air) line to the locking port. Push down on the actuator non-pressure plate; maintaining air pressure at the locking port. As the shaft is unlocked (released), ease the non-pressure plate back and remove the push plate and shaft assembly with push rod and return spring.
9. While holding cap assembly down against roller spring tension, completely remove four (4) machine screws, release cap assembly, and remove.
10. Remove retainer from cap by turning in clockwise direction until tabs of retainer line up with slots in cap. Remove retainer spring and seal. Remove inner and outer cap o-rings.
11. Remove roller spring (G), spring seat washer, and eight (8) rollers (F) (Fig. 3).
12. Remove collar (E), piston (C), and piston o-ring. NOTE: If necessary, apply air cautiously at the lock port to assist in removal of the above parts.
13. Remove rear retaining spring by dislodging from groove of plate and remove rear seal.
14. Inspect bearing in shaft bore on non-pressure plate, and remove only if it shows signs of wear and is to be replaced. The push rod should not be removed from the shaft unless it is damaged and requires replacement. To remove rod, place a heavy washer over the rod against the shaft; position a spacer (short length of pipe) and a second washer over the rod (and on top of the spacer). Install yoke lock nut(s) and turn down with a long-handled wrench, pulling the push rod from the shaft.
15. Remove exhaust check valve from non-pressure plate.
16. The studs in the non-pressure plate may be removed and replaced if necessary.

CLEANING AND INSPECTION

1. Wash all metal parts in a good cleaning solvent and dry thoroughly. It is generally recommended that all rubber parts be replaced; however, any rubber parts that are to be reused should be wiped dry.
2. Discard felt breather.
3. Inspect all parts for excessive wear or deterioration. Particular attention should be given to the piston and

collar bores in the non-pressure plate. The air passage from the lock port to piston bore should be checked for restriction and cleaned; if necessary, remove the inspection plug to thoroughly clean this passage.

4. Rollers should be carefully checked, and all rollers replaced if one or more need replacing.
5. Check springs for cracks, distortion, or corrosion.
6. Replace all parts not considered serviceable during these inspections.

ASSEMBLY

1. Line up parts as they were marked prior to assembly.
2. If the bearing in the non-pressure plate was removed, it should be re-installed or replaced if necessary.
3. Lubricate piston and collar bores, shaft, piston o-ring, piston and roller cavity liberally with "Never Seez" lubricant (BW 404-M).
4. Position piston o-ring in piston bore, then piston with smooth end down against o-ring.
5. Place collar in its bore (chamfer side down).
6. Coat rollers thoroughly and liberally with "Never Seez" lubricant (BW 404-M) and place eight (8) rollers in grooves formed by top of piston and collar ramp.
7. Pack roller cavity liberally with "Never Seez" lubricant (BW 404-M).
8. Place roller spring seat washer on top of rollers.
9. Position cone-shaped roller spring on washer with smaller end to washer.
10. Install o-rings in cap: small o-ring in inner bore, large o-ring on outside of cap, making certain o-rings are properly seated in grooves.
11. Place seal in bore of cap. Lip of seal should face front of cap. Place retainer spring on seal, position retainer on spring, compress spring, line up tabs on retainer to slots on cap, and lock retainer on cap by turning 1/4 turn counterclockwise.
12. Position cap on roller spring. DRAIN HOLE IN CAP SHOULD BE POSITIONED SO IT LINES UP WITH DRAIN AREA of non-pressure plate. Press cap down and hold while installing four (4) machine screws evenly and securely. Install new felt breather.
13. Turn over non-pressure plate assembly and install rear seal. Lip of seal faces non-pressure cavity. Install spring retainer, making certain it is retained in groove of non-pressure plate.
14. Install push plate return spring (larger end down).
15. Position push plate and shaft over return spring and press down so shaft moves through lock. The lock should hold shaft position against return spring. If not, check previous assembly procedure.

16. (SD-3™ Actuator) Install diaphragm, pressure plate, and clamping ring.

17. (DD-3™ Actuator) The DD-3™ actuators are supplied with two different diaphragm constructions. Figure 1 shows one construction with a metal separator between the service and auxiliary diaphragms. The separator snaps over a bead on the service diaphragm. The service diaphragm piece number for this assembly is 246371 for the type 30 and 246365 for the type 24.

An alternate design eliminates the separator in the type 30 and substitutes service diaphragm 292711 with a special surface lubricant which eliminates the need for the separator. This design has not been produced in the type 24.

Still a third design was used for certain customers for a short period, in which the service diaphragm and separator were riveted together as an assembly. If this construction is encountered, the diaphragm and separator assembly should be discarded. The new surface lubricated diaphragm 292711 may then be installed, without a separator. A kit, piece number 265071, is available which includes one of the new surface lubricated service diaphragm 292711 and one auxiliary diaphragm 246675.

18. Install service diaphragm and separator (if used), service pressure plate, and clamping ring.

19. Install auxiliary diaphragm, auxiliary pressure plate, and clamping ring.

20. Tighten bolts on both clamping rings evenly and securely.

21. Install exhaust check valve.

22. If push rod was removed, replace with new rod and new locking ring. Pack shaft cavity with BW 204-M barium lubricant (piece number 240176 or piece number 246671). Install lock ring in groove on rod and press rod in shaft cavity, making certain rod is locked in place in shaft.

23. Install new gasket on non-pressure plate.

24. Install boot over cap assembly. Install splash plate over boot.

OPERATING AND LEAKAGE CHECKS

OPERATING - DD-3™ ACTUATOR

With the actuator in the released position, make several brake applications and note that actuators apply and release properly.

Operate parking control valve and observe that actuators apply. While actuators are in a parking position, drain air supply to auxiliary diaphragm and note that actuators remain applied.

Replenish air supply to auxiliary diaphragm. Operate control valve to release parking application, then make a full service application to complete release of actuators. The magnitude of the service brake application to release the brakes may vary on different vehicles due to compressor governor settings. Normally a service application of approximately 70 psi should release the brakes.

OPERATING SD-3™ ACTUATOR

With actuator in the released position, make several brake applications and note that actuator applies and releases properly.

Make a parking application, air pressure released from lock port. Release air pressure from service diaphragm and observe that actuators remain applied. Apply full reservoir pressure on service diaphragm and on lock port. Release application on service diaphragm and observe that actuator releases properly.

LEAKAGE - SD-3™ AND DD-3™ ACTUATOR

With system pressure up and actuators in the released position, check drain slot and around the push rod boot with a soapy solution to detect possible leakage past the locking piston grommet.

Make and hold a service brake application and again check the actuator drain slot or exhaust check valve for service diaphragm leakage. Continue to hold the service application and coat around the service and auxiliary diaphragm clamping rings with the soapy solution to detect seal leakage.

DD-3™ ACTUATOR ONLY

Operate the park control valve to apply a park or emergency application on the auxiliary diaphragm. Remove the hose connection at the service diaphragm port and observe for leakage which would indicate a failed auxiliary diaphragm. The auxiliary diaphragm clamp should again be checked for leakage while the auxiliary diaphragm is pressurized.

Should leakage be detected at the clamping rings in either of the above tests, the clamping ring nuts should be tightened evenly but only enough to stop leakage.

If the safety actuator does not function as described or leakage is excessive, it is recommended that it be returned to the nearest Bendix authorized distributor for a factory reconditioned actuator under the repair exchange plan. If this is not possible, the actuator can be repaired with genuine Bendix parts.

WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following general precautions should be observed at all times.

1. Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear safety glasses.
2. Stop the engine and remove ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components.
3. Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.
4. If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with an AD-IS™ air dryer system or a dryer reservoir module, be sure to drain the purge reservoir.
5. Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.
6. Never exceed manufacturer's recommended pressures.
7. Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.
8. Use only genuine Bendix® replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.
9. Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.
10. Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.

